



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Design and Development of Motorized Cold Air Intake System

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Manufacturing Engineering (Manufacturing Design) with Honours

By

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Faculty of Manufacturing Engineering

May 2008


UNIVERSITI TEKNIKAL MALAYSIA MELAKA
BORANG PENGESAHAN STATUS LAPORAN PSM
JUDUL:
“Design and development of Motorized Cold Air Intake System”
SESI PENGAJIAN: Semester 2 2007/2008

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I hereby, declare this thesis entitled “Design and Development of Motorized Cold Air Intake System” is the result of my own research except as cited in the references.

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APPROVAL

This PSM submitted to the senate of UTeM and has been as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) with Honours. The members of the supervisory committee are as follow:

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ABSTRACT

Motorized Cold Air Intake System is a kit which is a replacement for the stock (Original Equipment Manufacturer) air intake system. This system is design based on the force induction system which is called “turbo charger”. This system would allow the car to have a much cooler air channeled to the cylinders. Cooler air means that there is a large amount of oxygen. This means that the car would have a better performance without sacrificing fuel efficiency and economy. The advantage of this system is that it creates a high velocity of air travels through the pipes of the intake with less air turbulence and resistance.

ABSTRAK

Motorized Cold Air Intake System adalah sebuah kit di mana ianya di reka sebagai pengganti kepada stok penapis udara keluaran kilang (OEM). Sistem ini di hasilkan berdasarkan konsep “turbo charger”. Sistem ini membenarkan kenderaan berkenaan memperolehi udara yang lebih sejuk dan ini bermakna, udara yang lebih sejuk mempunyai kadar kandungan oksigen yang lebih tinggi untuk di salurkan kepada silinder enjin. Secara langsung, kenderaan tersebut akan memperolehi kelebihan kuasa kuda tanpa mengorbankan ekonomi bahan bakar. Kelebihan system ini adalah, ia meningkatkan halaju udara melalui saluran udara dengan kadar “turbulence” dan rintangan yang rendah.

DEDICATION

I would dedicate this project to my parents, family members, and especially to my car because it helps me a lot in understanding the mechanical part and making this project a success.

ACKNOWLEDGEMENTS

For this project, I would like to say thanks to ALLAH S.W.T. and all the person who had given opportunity and helping hand to carry out this research in this case study for my Projek Sarjana Muda. I wish to acknowledge and express my gratitude and appreciation to these following persons for their time, commitment in guiding and supported through out completing this thesis:-

1. My supervisor, Mr Muhammad Syafik bin Jumali for his supervision, ideas, encouragement, and assistance in making the research a success.
2. My parents and sister for their moral support, guidance and financial support.
3. My panel of examiner for their comments and critics in the past Projek Sarjana Muda 1 semester.
4. To all my friends who gave their ideas and shared their knowledge.

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CHAPTER 1

INTRODUCTION

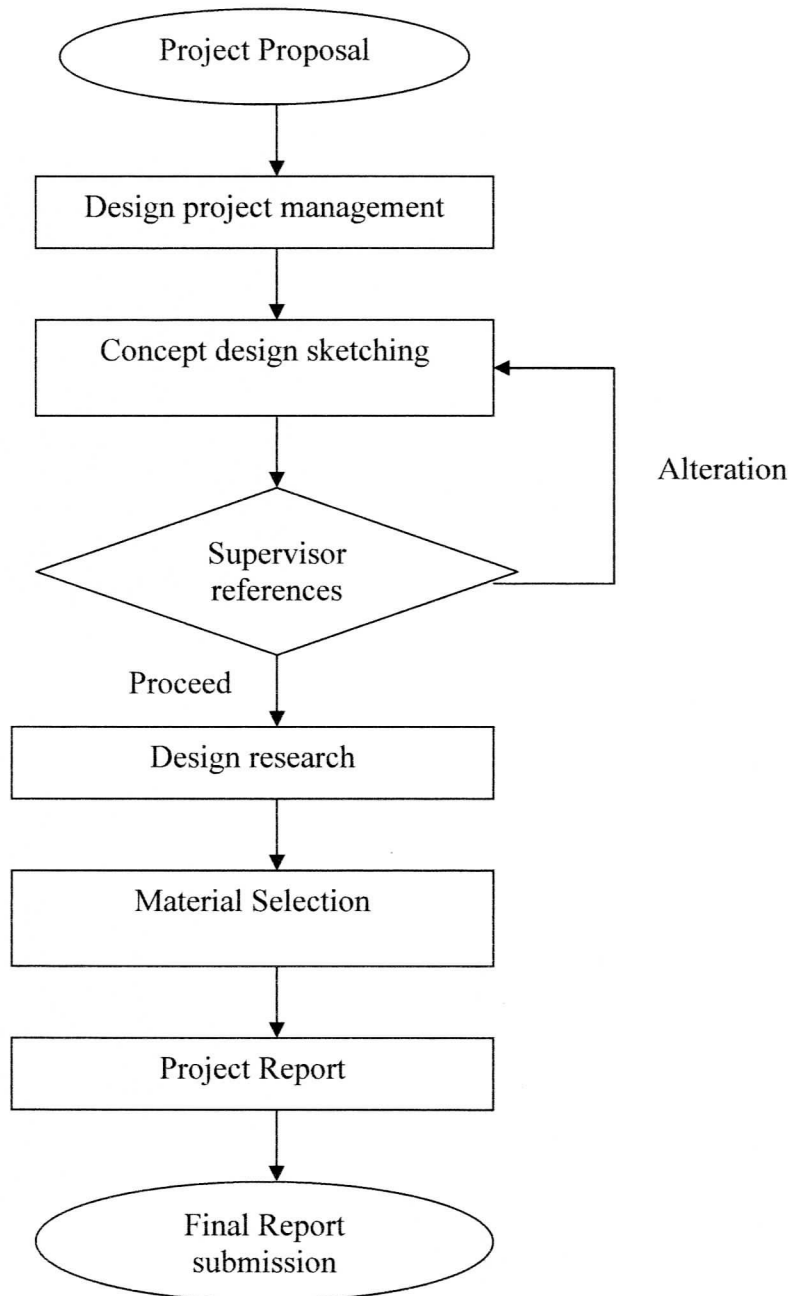
‘Projek Sarjana Muda’ (PSM) is compulsory to the final year students in UTeM in order to complete their degree in the engineering course. PSM give the opportunity for the students to do research and project based on the subjects learned in the classes, the experience they get during the industrial training and any cases related with the project.

Vehicle air intake system plays an important role on the performance of the car. It is one of the factors which give an implication towards the fuel combustion of the engine and also fuel efficiency while at the same time affect the Brake Horse Power (bHP) of the car itself.

In the current market, there are various types of air intake system which are design to suit various types of car models with some are design to be universal and also implement the “plug and play” concept.



1.1 Project Flow Chart





1.2 Background (Engine Types)

1.2.1 Carburetor Engines

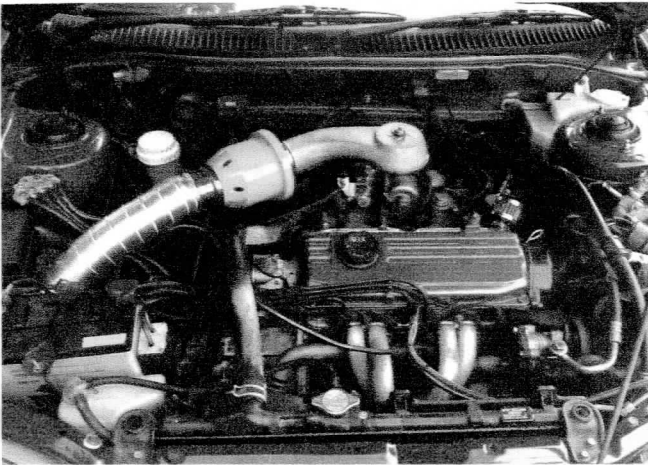


Figure 1.0: Example of Carburetor Engine

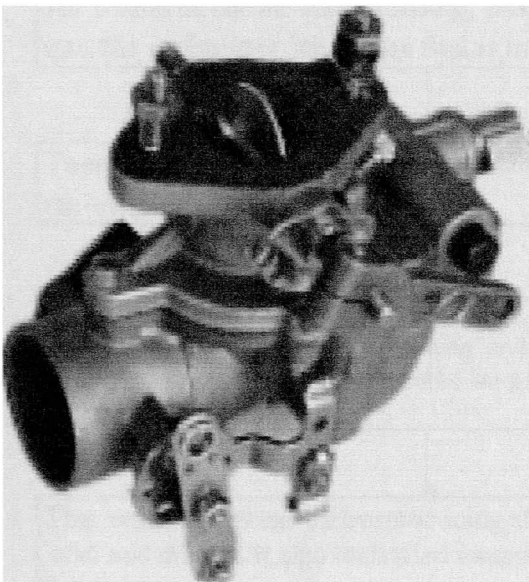


Figure 1.1: Carburetor Intake Throttle

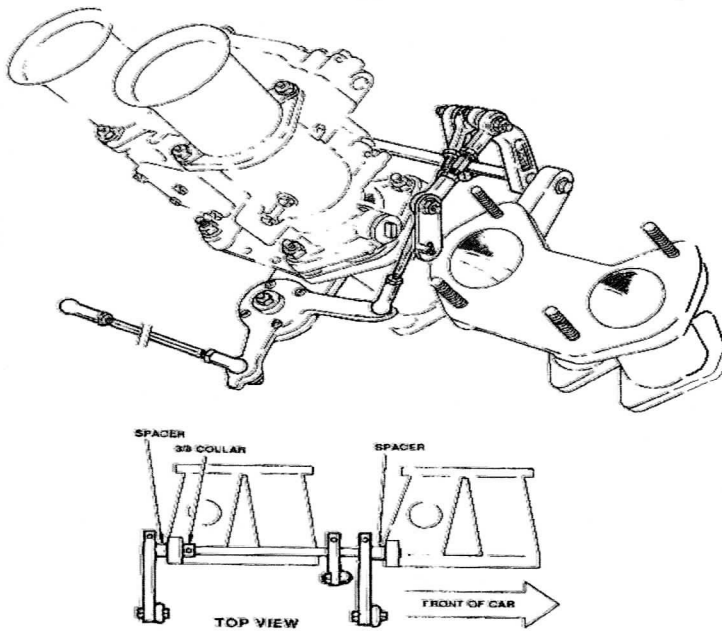


Figure 1.2: Parts on The Carburetor Throttle

1.2.2 Carburetor Engine Basic Working Principle

Air comes in the air filter housing, passes through the air filter, into the carburetor where the fuel is mixed with it.

Then it passes through the intake manifold and is drawn into the cylinders.

Air Temperature Sensor in the air intake, It was used to measure the air temperature and, by opening and closing a flap, allow cool air in through the air horn or heated air piped in from around an exhaust manifold.

This was to prevent carburetor icing that would cause the car to stall and die out. It also facilitated vaporization of the fuel into the air stream.



The target of a carburetor working properly is to mix just the right amount of gasoline with air so that the engine runs properly. If there is not enough fuel mixed with the air, the engine "runs lean" and either will not run or can even potentially damages the engine. If there is too much fuel mixed with the air, the engine "runs rich" and either will not run (it floods), runs very smoky or at the very least wastes fuel. The carburetor is in charge of getting the mixture at the best rate achievable.

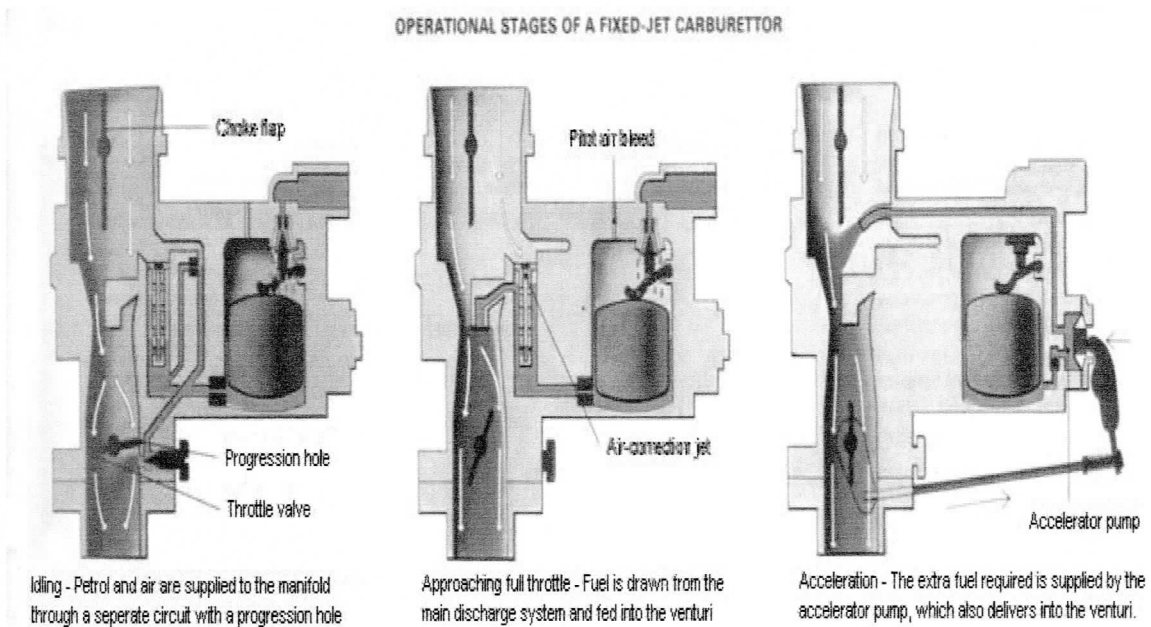


Figure 1.3: Operational Stages Of Carburetor



1.3 Injection Engines

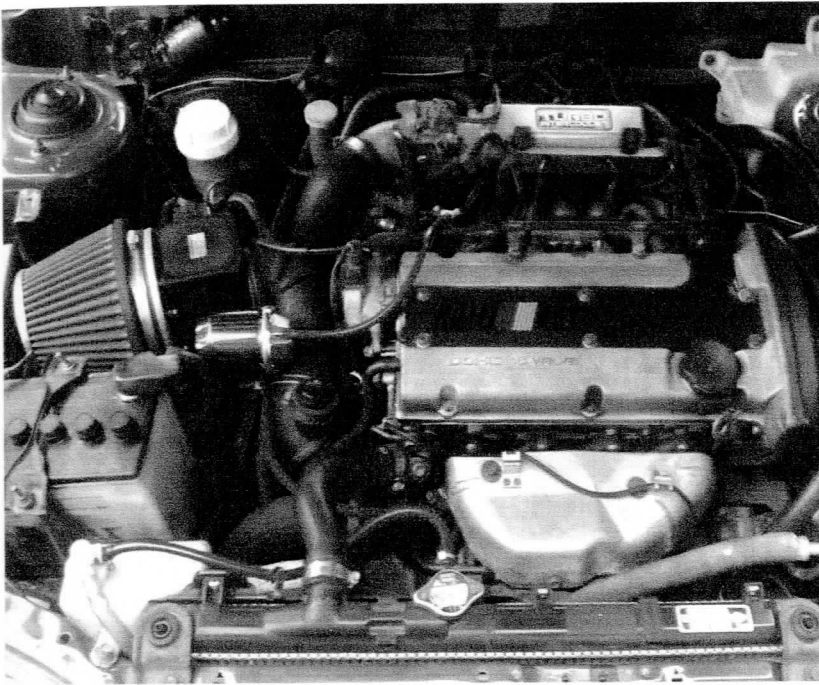


Figure 1.4: Example of Injection Engine

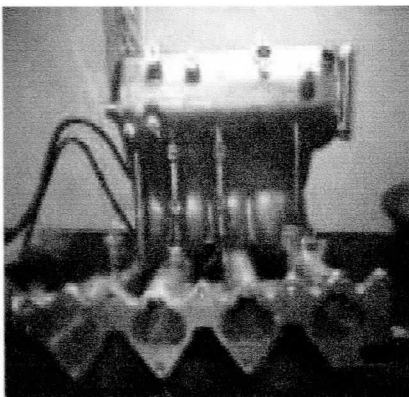


Figure 1.5: Injection Engine Intake Manifold

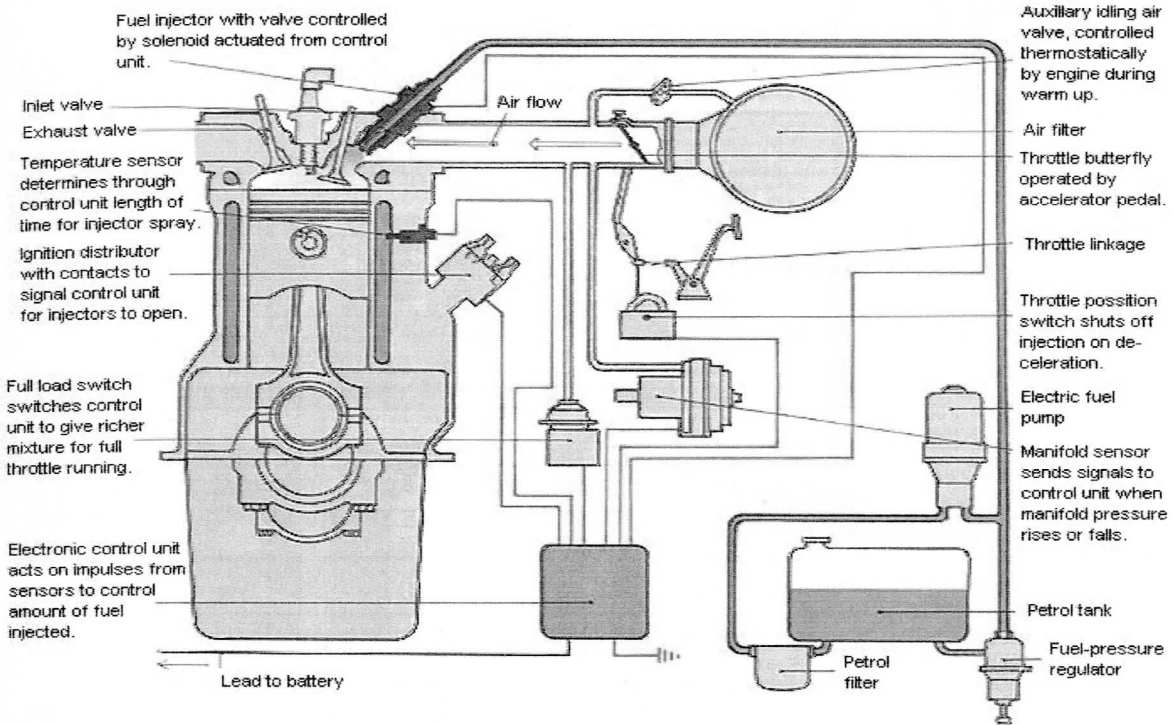


Figure 1.6: Injection Engine Working Principle



1.3.1 Injection Engine Basic Working Principle

Air is drawn in through the air intake. This is usually a long plastic tube going into the air filter housing
**The reason the intake tube is long is to get the air moving in a fairly steady, more coherent stream.

The air then passes through the air filter and then through an Air Flow Meter.

The voltage signal from Air Flow Meter then goes to the main EFI (Electronic Fuel Injection) computer and allows the adjustment of the fuel mixture.

The air through Air Flow Meter and it goes to the throttle chamber.

The throttle chamber controls the airflow into the engine. When it's closed, the car idles. There is a small bypass chamber that allows a small amount of air to bypass the throttle plate and go into the engine. By adjusting the amount of air through the bypass, we can adjust the idle speed of the engine.

There is also a Throttle Position Sensor (TPS) mounted on the throttle plate that sends a signal to the main EFI computer telling it whether it is at idle, midrange cruising or wide open throttle. From the throttle chamber it goes through the intake manifold and into the cylinders.

Cold Start Valve. It is electrically heated and performs the same function as the choke on a carburetor. The Cold Start Valve is a valve with a bi-metallic element that expands as it's heated. When it's cold, it allows a large quantity of air to bypass the throttle plate thus causing an increase in idle speed. As the element heats up, it closes the bypass passage and lowers the idle speed as the engine obtains normal operating temperature.



1.4 Air Filter



Figure 1.7: Examples of Various Shapes of Air Filters for different type of usage.

1.4.1 Function of an Air Filter

An air filter is a device which removes contaminants, often solid particulates such as dust, pollen, mold, and bacteria from air. Air filters are used in application where air quality is important, notably in building ventilation systems in engines. Air Filter systems allow a car to “breathe” easier creating more horsepower and greater gas mileage. Car air intake systems have different styles to choose from.

There are 2 types of air filter in the current market which are:

- 1) Open Pod Air Filters
 - Open element car air intake systems give you a reusable air filter, tube, and couplers which replace the factory components from the air box to the throttle body of your car. Using engine air and loosing the air box to gain access to all the surrounding air in the engine bay is how open element car air intake systems get more air for your motor giving you better gas mileage and more horsepower for your car.



Figure 1.8: Example of Open Pod Air Filter

2) Drop-In Air Filters

- The sealed car air intake systems rely on changing the stock filter and tubing along with using or replacing the stock air box of your car. Keeping or replacing the factory air box keeps from exposing the car air intake systems to the hot engine air which can result in a horsepower loss. Some open element car air intake systems due create a sealed car air intake systems by adding walls and using the hood as the lid in your car. Sealed car air intake systems are becoming more common and make more horsepower along with better gas mileage for your car.

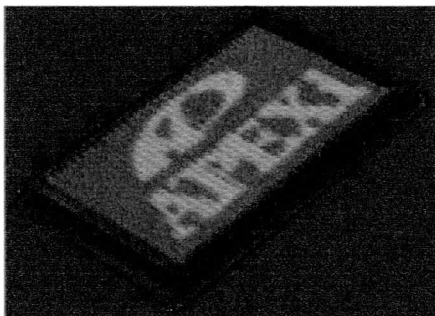


Figure 1.9: Example of Drop In Air Filter (Filter Inside Standard Box)